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| 10/823,836 | 04/13/2004 | Kramadhati V. Ravi | 42P18240 | 5533 |

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| EXAMINER | |
|---|---|
| GEORGE, PATRICIA ANN | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1765 | |

DATE MAILED: 07/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/823,836 | RAVI, KRAMADHATI V. | |
| | Examiner | Art Unit | |
| | Patricia A. George | 1765 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) *19-31* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/18/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

Claims 19-31 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 5/09/2006. In the same reply, applicant's elected, without traverse, group I, claims 1-18.

### *Claim Objections*

Claim 7 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Although, claim 7 refers to "etching", while claim 1, recites "removing", the two words are synonymous thus, fail to further limit the subject matter.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claim 1, it is unclear what "a substantial amount" is referring to. Please make an appropriate correction.

As to claim 17, it is unclear if the two steps of exposing of the first diamond layer, noted in lines 1 and 4, are the same steps or separate steps.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1, 2, 3, 6, 7, 8, 10, 11, 15, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Choi et al. (herein refered to as Choi) (Electron energy distribution of diamond-coated field emitters; Journal of Vacuum Science and Technology B: Microelectronics and Nonameter Structures; 3/1998, Vol. 16, issue 2, pp. 716-719) evidenced by Sokolowska (The structure and mechanical properties of carbon layers formed by crystallization from pulse plasma; Journal of material Science 21 (1986) 763-767), further evidenced by Cagin et al. (Nanotechnology 10 (1999) 278-284; Simulation an experiments on friction and wear of diamond: a material for MEMS and NEMS application) and Ristein (Elsevier Science S.A.; 2000; Diamond and Related Materials 9 1129-1137; Electronic properties of diamond surfaces – blessing or curse for devices?).

Choi at el. teaches a method for coating (i.e. forming a layer) on an emitter (i.e substrate), with a diamond layer; and replacing (i.e. removing) hydrogen (from anneal)

with oxygen at internal defects (pg. 718, col. 2, line 14) to change the surface, which indicates removal of a substantial amount (see abstract).

As for pores formed in diamond layers, see Sokolowska et al. for evidence diamond lattice bonds arrange disorderly, thus structure inherently contains numerous pores of various sizes. (see page 766, section conclusions, last paragraph).

As for claim 2, Choi teaches enhanced electron emissivity (i.e. reducing the dielectric constant) (see abstract).

With respect to claim respect to claim 3, Choi teaches the diamond layer is formed by chemical vapor deposition (see (pg. 718, col. 2, line 5).

As to claim 6, wherein the diamond layer comprises vacancies, please see discussion toward claim 1 (i.e. pores).

With respect to claim respect to claim 7, please see discussion toward wherein removing, above.

With respect to claim respect to claim 8, Choi teaches exposing to oxygen gas at room temperature (see, which is below about 450 degrees Celsius, as applicant claims.

With respect to claim respect to claim 10, Choi teaches etching the defects comprises exposing the defects to hydrogen and oxygen plasmas (see abstract).

As to claim 11, Choi teaches the hydrogen plasma treatment provides passivation (see abstract), which inherenty reduces the coefficient of friction of a top surface of the diamond layer, evidenced by Cagin et al. (see abstract).

As to claim 15, Choi teaches a first diamond layer which inherently comprises a mixture of sp2 bonds and sp3 bonds (see evidence in Nature of Carbon Bonding, pg. 8

and 10); and inherently removes the sp2 bonds on the surface (evidenced by Ristein, see abstract).

As to claim 17, see discussion toward claim 15.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4-5, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. in view of Catledge et al. (High density plasma processing of nanostructured diamond films on metals; Journal of Applied Physics, Vol. 84, No. 11; Dec. 1998)

Choi is silent as to the process parameters of the forming of the diamond layer, such as: to use a concentration of hydrogen that comprises above 10% methane, as in claims 4 and 5; and using a plasma, as in claim 16.

Catledge et al. teaches is well known to use a concentration of hydrogen that comprises 5-15% methane, as in claims 4 and 5; and using a plasma, as in claim 16 (see abstract).

Since Choi does not limit the gas concentraton used for coating a diamond layer, it would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the process parameters for CVD-diamond films, as Catledge et al.,

when performing the method of coating, as Choi, because Catledge et al. teaches the mechanical properties and adhesions of these films make them very attractive for a variety of applications (see abstract).

Although, Choi is silent as to forming a second diamond layer, as in claim 18, it would have been obvious to one of ordinary skill in the art at the time of invention was made, to use the method of forming the diamond layer, as Choi, to form the second diamond layer, as applicant's claimed limitation, because Choi teaches a method that is shown to be effective and has manufacturability.

***Claim Rejections - 35 USC § 103***

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. in view of applicant's admitted prior art.

Although Choi teaches oxygen anneal process, Choi is silent as to using an RTP.

Applicant states "Another oxidation process that may be used is utilizing molecular oxygen and a rapid thermal processing apparatus, as is well known in the art." (see para. 20).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the well known use of RTP, as in applicant's specification, when performing an oxygen anneal process, as Choi, because applicant's teach it is well known in the art.

***Claim Rejections - 35 USC § 103***

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. in view of Gasworth (5,516,554).

As to claims 12, Choi is silent as to the forming a diamond layer deposition chamber of a cluster tool.

Gasworth (5,516,554) teaches forming a diamond layer in a deposition chamber of a cluster tool (col.3, lines 45-55).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the use of a cluster tool, as Gasworth, to form a diamond layer, as in Choi, because Gasworth teaches it will allow a design for maximum growth rate With respect to claim minimum gasification time (col.3, lines 45-55).

***Claim Rejections - 35 USC § 103***

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. in view of White et al. (6,231,716).

Choi et al. is silent as to the oxidation chamber being part of a cluster tool, as in claim 13.

White teaches oxidation (col. 1, lines 10-15) may occur in the RTP Centura (col. 12, lines 17-25).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to use a cluster tool for the deposition and oxidation steps of

applicant's instant invention, when performing the method of coating diamond layer, as Choi et al., because White teaches the said configuration is made readily available by Applied Materials, Inc.

### *Claim Rejections - 35 USC § 103*

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. and Catledge et al., as applied to claims 4-5, 16, and 18 above, further in view of Gasworth, as applied to claim 12 above, and White et al. as applied to claim 13 above.

Claim 14 please see discussions toward claims 12, 13, and 18 above.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Patricia A George
Examiner
Art Unit 1765

PAG
06/06

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